

Sector Analyses



To prepare its Economic Development Strategy, the City decided to have a Summary Report focusing on conclusions and strategies, with several appendices providing the technical details to support those conclusions. Among the appendices are those that evaluate several industrial sectors. This appendix provides an overview of the methods used to write the ten sector analyses, and comparison information on the ten sectors.

There are ten sectors that the City chose for evaluation. The sectors selected are not to be considered “target industries”: they were not selected as industries necessarily requiring or meriting special attention by the City. Rather, they were selected as in some way significant (historical importance, size, growth prospects, local interest in the sector) and useful to illustrate issues that may be more general and apply to other sectors not evaluated. The 10 sectors selected were:

- High technology
- Bioscience
- Metals
- Transportation equipment
- Distribution and logistics
- Sustainable industries
- Creative services
- Professional and business services
- Tourism
- Destination retail

In the early stages of this project, it was discussed whether research would be conducted to determine which sectors were the most important ones to evaluate for any number of reasons: absolute size; potential multiplier effects; provision of essential services to larger sectors; unique opportunities for growth; ability to be measured with existing data sources; likely response to public assistance. It was decided that it would be better to select the sectors in advance because (1) a lot of work on sectors had already been done, and it would not be that difficult to select a number of key sectors, (2) using an analytical method to select sectors would add significantly to the effort and time necessary to complete the study, and (3) there was already some interest from City decisionmakers in certain sectors (e.g., “sustainable industries”).

The rest of this summary appendix is divided into two main sections. The first, “The Sector Reports,” describes the background and methodology relevant to all the sector reports. The second section, “Sector Comparisons,” compares sectors to one another on a number of variables like employment

and wages. This comparison information is not available in the sector reports themselves, which each focus only on one sector.

THE SECTOR REPORTS

SECTOR DEFINITIONS

Any description of an industrial sector requires a definition of what businesses that sector contains. That description not only facilitates communication; it is essential in order to collect data about the size of the industry from any of the standard sources. Many of the ten chosen sectors cut across industrial sectors; there are no standard definitions of these industries or the types of firms that should be included in them. Public agencies do not collect or codify data by these sectors. The solution was to define the sectors as a compilation of industrial codes, which allowed access to data that are disaggregated by these codes.

We found that the new and now standard North American Industrial Classification System (NAICS) more closely matched the sectors than the older Standard Industrial Classification (SIC) system. Fortunately, the U.S. Economic Census data are presented by NAICS and include all types of businesses including those with no employees (like sole proprietorships and partnerships, etc.) Such non-employee firms constitute a large share of certain clusters. Since the Census data are cross-sectional, we relied on the Census for much of the analysis.

Oregon Employment Department data was also used in the analysis. The Employment Department is still in the process of changing over from SIC to NAICS, so their data were only available by the SIC system. In addition, the SIC data do not capture non-employee establishments. The data are still useful, especially in identifying the exact location of economic activity between the City and the region. The Economic Census provides a bridge that allows us to reclassify SIC data by NAICS.

In response to the first drafts of the sector reports, groups representing four of the ten sectors raised issues with the initial definitions, and these issues led to some changes to the previous definitions.

First, the retail sector group decided to include eating and drinking places in the sector, whereas the initial definition had followed the NAICS definition of the sector in excluding these establishments.

Second, the professional and business services sector group decided to focus on a more narrow subset of the initial sector definition. This new subset excludes most business service industries that have lower paying business support jobs, and focuses more on higher-paying professional services.

Third, the tourism sector group expressed concern with defining the sector as those industries that have most of their revenues from tourists; it instead suggested measuring the sector as any portion of all sectors that are

supported by tourists. This alternate measurement, however, would have led to the tourism sector being measured as fractions of every industry. Since employment, wage, and other important data are made available at the industry level, rather than at the level of the geography or travel purpose of customers, it was agreed to keep the original definition of this sector. When considering the statistics presented in this appendix and the tourism sector report, one should remember that this definition does not measure the true size of the economy supported by tourism. It is more than likely that the overstatement occurring through including the entire part of an industry that receives most of its revenues from tourists is outweighed by the understatement occurring through omitting the contributions of tourists to all the other industries.

Fourth, the difficulty in defining the sustainable industries sector led the sector group to recommend dispensing with any definition of the sector based on the identification of specific industries. Members of the group made the valid point that sustainability is based on practices that can be applied in any sector, and that it is difficult to identify entire industries that are by definition “sustainable” because of the nature of their products. For this reasons, the sustainable industries sector is not included in the comparison tables in the rest of this appendix.

DATA SOURCES AND TERMINOLOGY

ECONOMIC CENSUS VS. COVERED EMPLOYMENT DATA

Because two main data sources are used to describe the sectors—the 1997 Economic Census and 2000 covered employment data from the Washington and Oregon employment departments, it is important to understand the main differences between these sources, and how these different sources can lead to slightly different results.

First, and most obvious, is the fact that the Economic Census data is about three years older than the 2000 covered employment data. The Economic Census is conducted every five years, so the 2002 Economic Census has yet to occur. The fact that the Economic Census data is three years older means that it slightly underestimates 2000 employment; for example, 1997 covered employment in the Oregon portion of the PMSA was 94% what is was in 2000.

Second, the 1997 Economic Census includes both employer and non-employer firms. Non-employer firms include, most significantly, the self-employed and partnerships. The Economic Census does not list the number of workers in these firms, but it lists the number of firms, from which an estimate can be made of workers in these firms. In contrast, the “covered employment” reported by state employment departments excludes non-employer firms, and any other employment that is not covered by state and federal unemployment insurance programs; for example, domestic workers, unpaid family workers, workers covered by the railroad unemployment insurance system, certain state and local government workers, certain

agricultural employees, and certain non-profit workers. From 1980 to 2000, the ratio of covered employment to total employment in Oregon averaged 87.9%, so we can assume that covered employment underestimates actual employment by about 12%. The Economic Census underestimates actual employment as well, because it does not include unpaid workers, but this underestimate is relatively small.

Third, the Economic Census collects data on the number of employees at one point in time (March 12, 1997) for all sectors except for construction and manufacturing, for which it uses an average of March 12, May 12, August 12, and November 12 employment. Covered employment, in contrast, is usually reported as an annual average of twelve months' data. For industries where employment is highly seasonal, such as tourism, the March data may deviate significantly from the annual average.

Fourth, the size of the sector differs depending on whether it is defined by NAICS codes (used by the Economic Census) or the older SIC codes (still used for covered employment). NAICS codes may include more or less employment than the best-matching SIC codes; this effect differs for each sector.

The overall effect of these four differences between Economic Census and covered employment data is difficult to predict. Assuming identical NAICS and SIC sector definitions, and assuming March employment is representative of an annual average, data from the 1997 Economic Census will show about six percent more employment than 2000 covered employment data will. This is because the underestimate due to the Economic Census's failure to account for post-1997 growth is probably outweighed by its inclusion of employment that covered employment data excludes. These are unrealistic assumptions, though. As a result, in some cases, 2000 covered employment data is higher than 1997 Economic Census employment data; in other cases, the opposite is true.

Of course, neither the 1997 Economic Census nor the 2000 covered employment data provide information on employment in 2002. The effect of the recent recession is not reflected in either 1997 or 2000 data, but it would suggest that inflating the 1997 employment data to 2000 is not as necessary, since employment slipped downwards from 2000 to 2002.

LOCATION QUOTIENTS

The sector reports refer to "location quotients" to describe the extent to which a particular sector is concentrated in the region relative to the rest of the nation. A location quotient is simply a ratio of ratios—specifically, the ratio of an area's employment in one industry to its employment in all industries, divided by the ratio of a larger area's employment in that same industry to this larger area's employment in all industries. Location quotients greater than one indicate that the industry is more represented in the smaller area (e.g., the region) than it is in the larger area (e.g., the nation), while location quotients less than one indicate that the industry is less represented in the smaller area than it is in the larger area. If, for example, mitten manufacturing accounts for 5% of employment in the

Portland metropolitan region, and also for 5% of employment in the United States, the location quotient is one. If mitten manufacturing accounts for 10% of employment in the region, the location quotient is two. If mitten manufacturing accounts for 2.5% of employment in the region, the location quotient is one-half. Putting the last example another way, the region has half the mitten manufacturing employment one would expect if its employment were distributed across industries at the same proportion as national employment. **In short, the higher the location quotient, the more concentrated the employment in that industry is in the area.**

Location quotients are interesting, but their interpretation is not straightforward. One common interpretation is that location quotients show the comparative advantage of an area in attracting and retaining various industries, and that they reflect the degree to which firms find an area advantageous. While this interpretation is probably correct, it is not clear that location quotients tell much about *trends*. A high regional location quotient in an industry might signal that the region is “tapped out,” and employment growth in that industry might stagnate unless there is national growth in that industry. A low location quotient might, in contrast, indicate untapped potential. In any case, location quotients do show, at a point in time, the concentration of an industry in an area.

LOCATION FACTORS

The analysis of each sector is organized in part around six issues of importance to businesses when they make decisions about initial location, re-location, and expansion. Factors that can be locally influenced are specifically focused upon (rather than external factors like the national and international economy, immigration patterns, and technology advances). These key local factors are discussed more fully in Appendix 2-3. The data and discussion of factors are grouped in the following six main categories:

- **Building space.** Includes land, built space, and utilities.
- **Workforce.** Includes skills, availability, and cost of labor.
- **Access to markets.** Includes transportation and telecommunications.
- **Business environment.** Includes regulations, taxes, and charging systems for some services like transportation and utilities.
- **Business formation and acceleration.** Includes innovative capacity, access to capital, and agglomerative economies (clusters).
- **Quality of life.** Includes quality of the K-12 educational system, crime rate, cost of living, and recreational opportunities.

Some of these location factors are related to direct business inputs, otherwise referred to as “factors of production;” these include building space and workforce. Others are more general factors affecting businesses; these include business environment and community stability. Advantages with

respect to these factors are what attract businesses, or cause others to stay or expand.

It is not just the cost of these factors that matters, but their quality and availability as well. Greater expenses for some factors are justified if they deliver value that makes businesses more productive. In addition, for some of these factors like building space and access to markets, *location and availability is critical.* In some cases, this means widespread availability so that businesses can have a lot of choice in how to optimize their location decision; in other cases, it means using resources to make the factors available where businesses find them most valuable.

ORGANIZATION OF THE SECTOR REPORTS

In general, the analysis of each of the ten sectors has five parts, as follows:

- **Description of the sector.** What the sector is, why it was selected, and how it is defined so that data can be assembled to describe it.
- **National trends.** What the change in employment in this sector has been nationally, and what likely trends are for the future.
- **Portland: The metro area and the city.** The size and characteristics of the region's sector relative to those of the nation, the size and characteristics of the City of Portland's sector relative to those of the region, and the main strengths and weaknesses of the local sector.
- **Issues.** What the main problems are with respect to the key location factors that the sector cares about
- **Strategies.** What public policy options are recommended to address the key issues for the sector.

HOW TO INTERPRET AND USE THE RESULTS

A key outcome of the Economic Development Strategy is a set of strategies and actions that PDC and the City of Portland can undertake that will encourage new business location, as well as the expansion and ongoing successful operation of existing businesses in the City. The sector analyses are therefore intended to describe each sector in sufficient detail to effectively determine its needs, as well as the economic levers that the PDC and the City can address. The sector analyses are not just *describing* what the sectors are, but also *highlighting* problem areas and *prescribing* public policy to encourage the growth of the sectors.

The sector descriptions tell a fairly accurate story about the sector in general, but this does not mean that all the observations are necessarily true about every business in that sector. For example, by observing that a certain business tends to prefer a location in the Portland central city rather than

the suburbs, it does not suggest that no businesses in that sector prefer the suburbs instead. Data is presented on averages and majorities, but few businesses are average, and some businesses are in the minority on any given factor. In particular, the observations on the problems that the Portland area has for each sector are based on interviews that by no means represent the totality of business views in that sector. There are undoubtedly other observations that businesses in each sector could make, and there are also undoubtedly disagreements within each sector as to the existence or the severity of certain problems. Despite these disclaimers, the data-based observations combined with industry interview summaries provide a useful summary of the main characteristics and some of the key issues in each sector. Moreover, these sector reports have now been reviewed and approved by industry panels representing each of the sectors. These observations can serve as a basis for further conversation and consideration of policy options.

The same is true for the various policy options and strategies to address the problems identified in each sector. Based on the problems identified in the data and interviews, as well as extensive review by industry panels, potential solutions that government could pursue were developed. Not every recommendation is necessarily supported by every business in a sector, and not every aspect of the economy is represented by these ten sectors. These sector recommendations served as a starting point for the Blue Ribbon Committee empanelled to oversee the development of the economic development strategy for the City of Portland.

SECTOR COMPARISONS

This section compares the ten sectors on several measures, including size, growth, wages, and multipliers.

SIZE

The size of sectors can be measured in several ways, each with different results. This section looks at revenue, payroll, and total employment; first for the nation, and second for the City of Portland.

NATION

Revenue

One issue to keep in mind is that revenues are not necessarily indicative of value-added or operating margins. Distribution and logistics sector and the retail sector rank high on total revenue, but this is in part because their gross revenues are high in proportion to the operating margins. For example, a wholesale company (in the distribution and logistics sector) may buy \$100 worth of product from a factory only to sell it to a store the next day for \$120. The gross sale is \$120, which shows up in the following table as revenue, but the actual operating margin (the money they keep to use to pay their workers and bills) is only \$20. Similarly, a retailer may pay the \$120 and sell the

product for \$175. Their gross revenue is \$175, but in reality they only have \$55 of net revenue.

These revenue issues for retail and distribution are important in considering Table 1, which ranks all ten sectors based on national revenues (in thousands of dollars), as reported by the 1997 Economic Census. Table 1 includes all types of businesses, even the self-employed. If adjustments were made to estimate net revenue rather than gross revenue, retail would probably rank at the top, and distribution and logistics would probably rank third. Tourism's ranking of ninth may initially seem surprising, but airlines, casinos, and amusement parks are not included in the definition of this sector.

Table 1: Sectors by 1997 U.S. revenue (\$1000s)

| Rank | Sector | 1997 Revenues |
|-------------|--------------------------|----------------------|
| 1 | Distribution & Logistics | \$4,438,089,817 |
| 2 | Retail | 2,788,344,548 |
| 3 | Metals | 686,561,692 |
| 4 | High Technology | 659,507,943 |
| 5 | Transportation Equipment | 575,527,001 |
| 6 | Professional Services | 448,526,020 |
| 7 | Creative Services | 300,167,994 |
| 8 | Biosciences | 192,753,108 |
| 9 | Tourism Industry | 175,125,343 |

Source: ECONorthwest, based on 1997 Economic Census

Payroll

If the sectors are ranked by payroll, retail is at the top, and biosciences ranks last, as shown in Table 2.

Table 2: Sectors by 1997 U.S. payroll (\$1000s)

| Rank | Sector | 1997 Payroll |
|-------------|--------------------------|---------------------|
| 1 | Retail | \$307,529,047 |
| 2 | Distribution & Logistics | \$297,261,587 |
| 3 | Professional Services | \$161,212,518 |
| 4 | High Technology | \$149,506,704 |
| 5 | Metals | \$134,169,933 |
| 6 | Creative Services | \$90,280,791 |
| 7 | Transportation Equipment | \$79,616,518 |
| 8 | Tourism Industry | \$43,686,869 |
| 9 | Biosciences | \$40,069,864 |

Employment

The number of employees is a third way to rank sectors, but there are several issues to keep in mind. First, this only counts paid employees, not self employed people and business partners. Secondly, the 1997 Census collects information on first quarter (as of March 12) employment, not annual average employment, for all sectors except manufacturing and construction.

Table 3 shows that two sectors are very large (with more than 10 million paid employees): retail, and distribution and logistics. The smallest sector by a wide margin is biosciences.

Table 3: Sectors by 1997 U.S. paid employees

| Rank | Sector | 1st Qtr. 1997 Paid Employees |
|------|--------------------------|---------------------------------|
| 1 | Retail | 24,214,196 |
| 2 | Distribution & Logistics | 10,032,011 |
| 3 | Professional Services | 5,426,113 |
| 4 | Metals | 3,878,926 |
| 5 | High Technology | 3,418,866 |
| 6 | Creative Services | 2,885,765 |
| 7 | Tourism Industry | 2,693,273 |
| 8 | Transportation Equipment | 1,845,596 |
| 9 | Biosciences | 988,892 |

Source: ECONorthwest, based on 1997 Economic Census

CITY OF PORTLAND

The sectors' rankings on payroll and employment within the City of Portland are similar to their rankings within the nation.

Payroll

Two sectors generated over a billion dollars in payroll for their paid employees during 2000 in the City of Portland—distribution and logistics, and retail (which includes restaurants). Table 4 shows that nearly one out of every four dollars in wages earned by workers in Portland during 2000 came from one of those two sectors.

Table 4: Sectors by 2000 covered payroll, City of Portland

| Sector/Category | Total Payroll (\$ MN) in City of Portland | % of Total Payroll in the City |
|----------------------------------|--|---|
| Distribution & Logistics | \$2,302 | 15.0% |
| Retail | 1,332 | 8.7% |
| Professional Services | 828 | 5.4% |
| Transportation Equipment | 781 | 5.1% |
| High Technology | 585 | 3.8% |
| Metals | 532 | 3.5% |
| Creative Services | 419 | 2.7% |
| Tourism Industry | 206 | 1.3% |
| Biosciences | 55 | 0.4% |
| Total of all sectors | \$7,039 | 45.8% |
| less payroll in multiple sectors | -379 | -2.5% |
| Payroll in sectors (net) | \$6,660 | 43.3% |
| Payroll in non-sectors | 8,718 | 56.7% |
| Total covered payroll | \$15,378 | 100.0% |

Source: ECONorthwest, based on 2000 covered employment data from OR Employment Dept. and WA Employment Security Dept.

Employment

In 2000, there were about 188,000 paid workers in Portland in the nine sectors listed in Table 5. This is covered employment (as described earlier in this appendix), so self-employed people and small numbers of other types of workers are not counted. Since some industries appear in more than one sector, about 6,000 of this total is a double-count; the actual amount of covered employment (full-time equivalent or FTE) in these nine sectors is about 182,000. That equals nearly 45% of all the covered employment in the City in 2000. As with payroll, and as with national employment, the retail and distribution and logistics sectors are by far the largest, and biosciences is the smallest.

Table 5: Sectors by 2000 covered employment, City of Portland

| Sector/Category | City of Portland | % of City Employment |
|---------------------------------|-------------------------|-----------------------------|
| Retail | 62,498 | 15.3% |
| Distribution & Logistics | 56,110 | 13.7% |
| Professional Services | 14,768 | 3.6% |
| Transportation Equipment | 14,582 | 3.6% |
| Metals | 12,030 | 2.9% |
| Tourism Industry | 10,202 | 2.5% |
| High Technology | 9,786 | 2.4% |
| Creative Services | 6,852 | 1.7% |
| Biosciences | 1,324 | 0.3% |
| Total of all sectors | 188,152 | 46.1% |
| less those in multiple sectors | (6,157) | -1.5% |
| Net employment in sectors | 181,994 | 44.6% |
| Employment in non-sectors | 226,283 | 55.4% |
| Total covered employment | 408,278 | 100.0% |

Source: ECONorthwest, based on 2000 covered employment data from OR Employment Dept. and WA Employment Security Dept.

City's share of regional employment

Table 6 shows that about 42 percent of the covered employment in the PMSA is in the City. The sector with the highest concentration of employees inside the City is transportation equipment manufacturing. Tourism employment is also highly concentrated in the City of Portland. Two sectors whose employees are much more likely to be in the suburbs are biosciences and high technology.

Table 6: Sectors by City of Portland's share of regional covered employment, 2000

| Sector/Category | City of Portland | Rest of the PMSA | % in City |
|--------------------------------|-------------------------|-------------------------|------------------|
| Transportation Equipment | 14,582 | 2,532 | 85.2% |
| Tourism Industry | 10,202 | 4,688 | 68.5% |
| Professional Services | 14,768 | 8,601 | 63.2% |
| Distribution & Logistics | 56,110 | 54,296 | 50.8% |
| Creative Services | 6,852 | 8,372 | 45.0% |
| Retail | 62,498 | 111,363 | 35.9% |
| Metals | 12,030 | 25,764 | 31.8% |
| Biosciences | 1,324 | 3,636 | 26.7% |
| High Technology | 9,786 | 56,678 | 14.7% |
| Total of all sectors | 188,152 | 275,931 | 40.5% |
| less those in multiple sectors | (6,157) | (15,802) | |
| Net employment in sectors | 181,994 | 260,129 | 41.2% |
| Employment in non-sectors | 226,283 | 301,424 | 42.9% |
| Total covered employment | 408,278 | 561,553 | 42.1% |

Source: ECONorthwest, based on 2000 covered employment data from OR Employment Dept. and WA Employment Security Dept.

EMPLOYMENT GROWTH

NATION

Between the years 1990 and 2000 employment in the U.S. rose at a 1.3 percent rate, as shown in Table 7. Seven of the nine sectors saw their covered employment rise faster than that. The standouts in terms of employment growth were clearly the creative services, professional services, and high technology sectors. Employment growth in the metals and transportation equipment manufacturing sectors was below average.

Table 7: Sectors by national employment growth rate, 1990-2000

| Rank | Sector | Employment Growth Rate 90-00 |
|-------------|----------------------------|-------------------------------------|
| 1 | Creative Services | 7.3% |
| 2 | Professional Services | 2.9% |
| 3 | High Technology | 2.7% |
| 4 | Distribution & Logistics | 2.0% |
| 5 | Tourism Industry | 1.7% |
| 6 | Biosciences | 1.7% |
| 7 | Retail | 1.7% |
| - | US Total Employment | 1.3% |
| 8 | Metals | 0.1% |
| 9 | Transportation Equipment | -0.3% |

Source: ECONorthwest, based on U.S. Bureau of Labor Statistics covered employment data

Note: Tourism Industry does not include all impacts of tourism on the entire economy; it focuses on sectors receiving a majority of their revenue from tourists.

REGION

Employment in the Oregon portion of the PMSA grew much faster than the country. Table 8 shows that, as in the national statistics, the fastest growing sectors in the region were creative services and high technology. The slowest growing sectors were metals and transportation equipment manufacturing.

Table 8: Sectors by PMSA (OR portion) employment growth rate, 1990-2000

| Rank | Sector | Employment Growth Rate 90-00 |
|-------------|---|-------------------------------------|
| 1 | Creative Services | 7.1% |
| 2 | High Technology | 5.8% |
| 3 | Professional Services | 3.1% |
| - | PMSA (OR portion) total employment | 2.9% |
| 4 | Retail | 2.7% |
| 5 | Distribution & Logistics | 2.3% |
| 6 | Tourism Industry | 2.3% |
| 7 | Biosciences | 1.1% |
| 8 | Transportation Equipment | 0.9% |
| 9 | Metals | 0.6% |

Source: ECONorthwest, based on covered employment data from OR Employment Dept.

Note: Tourism Industry does not include all impacts of tourism on the entire economy; it focuses on sectors receiving a majority of their revenue from tourists.

WAGES

REGION

Table 9 shows that in the PMSA, excluding Portland, high technology tops the average annual wage list, probably because of the many Washington County research jobs in the semiconductor industry. Creative services also ranked high in 2000. Two sectors paid well below the average wage for the region (which was about \$35,000): retail and tourism.

Table 9: Sectors by 2000 annual average wage, PMSA excluding Portland

| Rank | Sector | Average Wage |
|-------------|--------------------------|---------------------|
| 1 | High Technology | \$81,693 |
| 2 | Creative Services | 57,274 |
| 3 | Metals | 49,371 |
| 4 | Distribution & Logistics | 48,597 |
| 5 | Professional Services | 46,749 |
| 6 | Biosciences | 46,733 |
| 7 | Transportation Equipment | 35,028 |
| 8 | Tourism Industry | 19,663 |
| 9 | Retail | 19,418 |

Source: ECONorthwest, based on 2000 covered employment data from OR Employment Dept. and WA Employment Security Dept.

CITY OF PORTLAND

Table 10 shows that in Portland the creative services sector pays the highest average annual wage. A significant number employed in the film and video component of that sector do not work year-round because of a paucity of productions in Portland, but when they are employed they are generally well-paid. The high technology, professional services, transportation equipment, and metals sectors also pay well. Biosciences and professional & business services employ a mix of well-compensated and low- to mid-compensated workers. Retail and tourism rank lowest.

For comparison purposes, the Citywide average annual wage rate in 2000, based on the ES-202 data analyzed, was \$37,665.

Table 10: Sectors by 2000 annual average wage, City of Portland

| Rank | Sector | Average Wage |
|-------------|--------------------------|---------------------|
| 1 | Creative Services | \$61,151 |
| 2 | High Technology | 59,775 |
| 3 | Professional Services | 56,057 |
| 4 | Transportation Equipment | 53,530 |
| 5 | Metals | 44,197 |
| 6 | Biosciences | 41,701 |
| 7 | Distribution & Logistics | 41,032 |
| 8 | Retail | 21,306 |
| 9 | Tourism Industry | 20,161 |

Source: ECONorthwest, based on 2000 covered employment data from OR Employment Dept. and WA Employment Security Dept.

MANUFACTURING

Table 11 shows the average hourly production worker wage as reported in the 1997 Economic Census of Portland for all NAICS-defined 3-digit manufacturing codes (plus one 4-digit (semiconductors)). This data is for the workers in the City only, and it includes only production workers, not office workers. While Table 10 shows that the high technology sector has a higher average wage than the transportation equipment sector, Table 11 shows that for *production workers only* the transportation equipment sector pays higher wages.

Table 11: Manufacturing wages, City of Portland, 1997

| Rank | Manufactured Product | Average Production Worker Hourly Wage |
|-------------|---------------------------------|--|
| 1 | Paper | \$18.38 |
| 2 | Transportation equipment | 18.35 |
| 3 | Textile mills | 17.46 |
| 4 | Petroleum | 16.95 |
| 5 | Computers & electronic products | 16.43 |
| 6 | Beverage products | 16.36 |
| 7 | Chemicals | 16.22 |
| 8 | Machinery | 15.68 |
| 9 | Semiconductors & components | 15.52 |
| 10 | Non-metallic mineral products | 15.23 |
| 11 | Primary metals | 15.05 |
| 12 | Printing and publishing | 15.05 |
| 13 | Fabricated metals | 13.96 |
| 14 | Electrical equipment | 13.25 |
| 15 | Food products | 13.14 |
| 16 | Wood products | 12.43 |
| 17 | Furniture | 11.98 |
| 18 | Plastics & rubber | 11.33 |
| 19 | Miscellaneous manufacturing | 11.24 |
| 20 | Leather products | 9.15 |
| 21 | Textile products | 8.42 |
| 22 | Apparel | 7.76 |

Source: ECONorthwest, based on 1997 Economic Census

MULTIPLIERS

The concept of economic “multipliers” is often used to compare the relative value of an investment in different industries. There are many types of multipliers, but they all show how an increase in some measure of an industry’s activity (output or sales, income, employment, etc.) can generate further increases in that same measure through the repeated spending, hiring, and wage paying that results from the initial change. The argument is often made that industries with high multipliers are a better investment because they generate more total economic activity for each unit of investment.

There are many important assumptions about multipliers. First, multipliers are based on the *ceteris paribus* assumption that the initial increase in output, employment, etc. does not lead to price adjustments or a structural change in the economy. Second, to avoid double-counting it is

important to avoid adding up multipliers across industries, because the multiplier reflected for one industry is in part the result of sales in various other sectors. One cannot simultaneously assume that a certain amount of new income in a region will: (1) lead directly to sales in Industry One that in turn support sales in Industry Two; and (2) lead directly to sales in Industry Two that in turn support sales in Industry One. One industry has to be chosen as the originator of the impact.

Third, and most important, multipliers are most useful when they are quantifying the effect of a change that originates *outside the region*—e.g., sales or income resulting from exports. If an increase in sales for one sector is supported by households and businesses *within a region*, those households and businesses are spending less on other sectors. There is therefore a transfer or substitution effect, where money is changing hands within a region but the region's economy is not experiencing a net increase. For this reason, it is important to look at the export-oriented nature of economic activity.

Table 12 shows the multiplier effects of a \$1 million increase in industry output (or sales) for the main types of industry. The first column shows that total regional sales will increase at a rate that varies from 58% in the case of finance, insurance, and real estate more than doubling in the case of construction and services. All sectors use the income from their sales to purchase other goods and services from other sectors; those with the higher multipliers (construction, manufacturing, services, and government) do more of this.

Each unit of total output that is generated has an effect on labor income that varies depending on the amount of value-added (that is, sales net of the cost of materials). For example, the amount of labor income generated from an increase in the manufacturing and transportation, communications, and utilities sectors is less than one-third that of the total output generated, because of the cost of materials. In contrast, increases in services and government activity generate labor income that is about one-half the total output.

The labor income in turn supports a certain number of jobs, depending on the pay levels in the various industries. Despite the lower regional labor income that results from an increase in output in the agricultural sector compared with an increase in the services sector, the total change in regional employment is equivalent (30) because pay rates are lower in the jobs supported by an increase to agricultural output (mostly agricultural jobs).

Table 12: Gross economic impacts associated with a \$1 million increase in output for five-county region

| Industrial Sector | Total Change in Regional Output | Total Change in Regional Labor Income | Total Change in Regional Employment | Average Labor Income per New Job |
|-------------------|---------------------------------|---------------------------------------|-------------------------------------|----------------------------------|
| Agriculture | 1,793,257 | 557,166 | 30 | 18,760 |
| Construction | 2,096,680 | 802,918 | 21 | 38,901 |
| Manufacturing | 1,956,848 | 590,087 | 15 | 39,318 |
| TCPU | 1,803,217 | 599,132 | 15 | 39,154 |
| Trade | 1,810,995 | 738,833 | 24 | 31,177 |
| FIRE | 1,580,097 | 428,741 | 12 | 34,429 |
| Services | 2,072,693 | 928,031 | 30 | 30,950 |
| Government | 1,934,284 | 1,063,350 | 28 | 38,509 |
| Other | 1,165,934 | 230,567 | 19 | 12,208 |

Source: ECONorthwest calculations using IMPLAN input-output model

Note: Five county region consists of Multnomah, Washington, Clackamas, Columbia, and Yamhill Counties

If the \$1 million in sales that generates the impacts shown in Table 12 all originate from outside the region, then the effects that are shown are *net effects*—that is, money and jobs are not simply changing hands within the region. If, however, the increase in output follows the typical patterns of each sector, with varying proportions supported by export sales, the net impacts are less. Table 13 shows how \$1 million in gross output translates into net output given typical export levels for each sector. Because agriculture and manufacturing are more export-oriented than other sectors, they have the highest net output impacts, net labor income impacts, and net job impacts per dollar of gross output. Services and government are not very export-oriented, so they rank lower in terms of net impacts than they do in terms of gross impacts.

Table 13: Net economic impacts to five-county region of \$1 million increase in gross output

| Industrial Sector | Assumed Percent of Output Made for Export | Assumed Output Made for Export | Net Change in Regional Output | Net Change in Regional Labor Income | Net Change in Regional Employment |
|-------------------|---|--------------------------------|-------------------------------|-------------------------------------|-----------------------------------|
| Agriculture | 49% | 489,000 | 876,903 | 272,454 | 15 |
| Construction | 21% | 207,000 | 434,013 | 166,204 | 4 |
| Manufacturing | 46% | 455,000 | 890,366 | 268,490 | 7 |
| TCPU | 32% | 317,000 | 571,620 | 189,925 | 5 |
| Trade | 30% | 296,000 | 536,055 | 218,695 | 7 |
| FIRE | 35% | 349,000 | 551,454 | 149,631 | 4 |
| Services | 18% | 180,000 | 373,085 | 167,046 | 5 |
| Government | 18% | 184,000 | 355,908 | 195,656 | 5 |
| Other | 22% | 219,000 | 255,340 | 50,494 | 4 |

Source: ECONorthwest calculations using IMPLAN input-output model

Note: Export is the assumed share of industry output sold outside of the five-county region.

The previous tables showed multipliers that illustrated the effect of an initial change in output. Multipliers can also be calculated that show the relationship between employment that is directly created by a certain level of output, and “indirect” or “induced” employment created by the flow-on effects of that output. For example, increased manufacturing sales leads to increased purchases in other sectors, leading to indirect job creation. In addition, a new

manufacturing job creates new household income that can be spent on new services, leading to induced job creation. Table 14 shows the relationship between direct job creation and indirect and induced job creation for each of the main industry types.

Sectors like agriculture have a low ratio of total jobs created to direct jobs created; that is, each direct job supports relatively few indirect or induced jobs. This is in part because the sector does less trading with other sectors as a result of increased sales, in part because the trading that is done with other sectors is more in materials than in labor, and in part because fewer indirect/induced jobs than direct jobs are created from each dollar of labor income because the direct jobs in the agriculture sector are relatively lower-paying.

In contrast, manufacturing has a high ratio of total jobs created to direct jobs created; that is, each direct job supports a relatively high number of indirect or induced jobs. This is in part because the sector does more trading with other sectors as a result of increased sales, in part because the trading that is done with other sectors is more in labor than in materials, and in part because more indirect/induced jobs than direct jobs are created from each dollar of labor income because the direct jobs in the manufacturing sector are relatively higher-paying.

Table 14: Gross employment impacts to five-county region of \$1 million increase in gross output

| Industrial Sector | Total Change in Regional Employment | Direct Jobs | Indirect or Induced Jobs | Total Jobs per Direct Job |
|-------------------|-------------------------------------|-------------|--------------------------|---------------------------|
| Agriculture | 30 | 21 | 9 | 1.4 |
| Construction | 21 | 9 | 12 | 2.4 |
| Manufacturing | 15 | 5 | 10 | 3.0 |
| TCPU | 15 | 6 | 9 | 2.4 |
| Trade | 24 | 14 | 9 | 1.7 |
| FIRE | 12 | 6 | 6 | 2.0 |
| Services | 30 | 18 | 12 | 1.7 |
| Government | 28 | 17 | 10 | 1.6 |
| Other | 19 | 17 | 2 | 1.1 |

Source: ECONorthwest calculations using IMPLAN input-output model

Note: Five county region consists of Multnomah, Washington, Clackamas, Columbia, and Yamhill Counties

What conclusions can be drawn from the tables above? First, the multipliers are not enormous; most sectors respond to additional output or sales by generating an additional 80-110% in sales (that is, the output multiplier ranges from 1.8 to 2.1). Second, the output multipliers (the ratio of total output to initial output) do not vary a great deal across the sectors. What varies more is the effect that output has on labor income and job creation, as a result in differences in materials costs and wages.

If one is concerned mostly with the amount of regional labor income that is created by additional export-oriented output, the services and government sectors seem to rank highest. If one is instead concerned with the total number of jobs created (regardless of how well-paying the jobs are), agriculture does as well as services. These observations are true only if the assumption is made that the level of initial export-generated output is equal. If the assumption is made, however, that the amount of total output is equal but the export-generated output varies, manufacturing and trade does a lot better than services and government. This latter assumption is probably the most important for economic development strategies in that these strategies most directly affect gross output or sales. In that sense, assuming all gross multipliers are equal, an economic development strategy would have a greater impact if it helped to increase gross output in an export-oriented sector.

The data that supports the analysis above is difficult to assemble in a way that corresponds with the ten industry sectors this project studied. To the extent that High Technology, Metals, and Transportation Equipment are mostly part of the manufacturing sector, their multipliers are likely to be more similar to those of the manufacturing sector than to those the services sector, which are probably more indicative of the multipliers found in the Professional Services sector.